Practice test

Problem 1. Is the following permutation odd or even:

$$\begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \\ 3 & 5 & 4 & 8 & 2 & 7 & 9 & 1 & 6 \end{pmatrix}$$

Problem 2. What is a maximum possible order of an element in the permutation group S_{10}? Find two permutations in S_{10} with such an order.

Problem 3. Identify the group of invertible elements in the ring $\mathbf{Z}/8$.

Problem 4. How many abelian groups (up to isomorphism) are there of order 24?

Problem 5. Use Sylow theorem to show that any group of order 255 is NOT simple.

Problem 6. Recall that $\phi(n)$ denotes the number of non-zero devisors in the ring $\mathbf{Z}/n$. Let p and q be different prime numbers. Calculate $\phi(pq)$.

Problem 7. Use Fermat's theorem to find the remider of 37^{49} when it is divided by 7.

Problem 8. Is the polynomial X^3+3X+2 irreducible in $\mathbf{Z}/5[X]$? Is it irreducible in $\mathbf{Z}/6[X]$?